

CLAIMS

1. A silicon carbide-based heat-resistance porous structural material produced by a process comprising the
5 step of:

impregnating a carbonized porous structural body with molten silicon, the structural body having open pores open to a surface thereof, which are generated due to a volume-reduction reaction, and at the same time containing porous
10 silicon carbide having a good wettability to molten silicon,

wherein the carbonized porous structural body is formed by the steps of applying a slurry by impregnation to a carbon powder-made porous structural body having a bone
15 structure, which is formed from powdered carbon, carbonizing the slurry, and then performing reaction sintering, the slurry containing powdered silicon and a resin used as a carbon source.

2. A silicon carbide-based heat-resistance porous structural material produced by a process comprising the
20 step of:

impregnating a carbonized porous structural body with molten silicon, the structural body having carbon on a surface thereof generated from a resin and at the same
25 time containing powdered carbon having a good wettability

to molten silicon,

wherein the carbonized porous structural body is formed by the steps of applying a slurry by impregnation to a carbon powder-made porous structural body having a bone structure, which is formed from powdered carbon, and then carbonizing the slurry.

3. The silicon carbide-based heat-resistance porous structural material according to Claim 1 or 2, wherein, as the carbon powder-made porous structural body having a bone structure, a carbon product having a honeycomb, a corrugated fiberboard, or a cardboard shape is used which is formed by adding a binding agent to the powdered carbon, followed by molding.

4. A method for manufacturing a silicon carbide-based heat-resistance porous structural material, comprising the steps of:

applying a slurry containing powdered silicon and a resin used as a carbon source by impregnation to a carbon powder-made porous structural body having a bone structure, which is formed from powdered carbon, then carbonizing the slurry at 900 to 1,300°C in a vacuum or an inert gas atmosphere, then performing reaction sintering at a temperature of 1,300°C or more in a vacuum or an inert gas atmosphere so as to form a carbonized porous structural body having open pores which are generated by a volume-

reduction reaction at the same time when porous silicon carbide having a good wettability to molten silicon is formed, and impregnating this carbonized porous structural body with silicon at a temperature of 1,300 to 1,800°C in a vacuum or an inert gas atmosphere.

5 5. A method for manufacturing a silicon carbide-based heat-resistance porous structural material, comprising the steps of:

10 applying a slurry containing a resin used as a carbon source by impregnation to a carbon powder-made porous structural body having a bone structure, which is formed from powdered carbon, then carbonizing the slurry at 900 to 1,300°C in a vacuum or an inert gas atmosphere so as to form a carbonized porous structural body having carbon
15 generated on a surface thereof from the resin and at the same time containing powdered carbon having a good wettability to molten silicon, and

20 impregnating this carbonized porous structural body with silicon at a temperature of 1,300 to 1,800°C in a vacuum or an inert gas atmosphere.

25 6. The method for manufacturing a silicon carbide-based heat-resistance porous structural material, according to Claim 4 or 5, wherein, as the carbon powder-made porous structural body having a bone structure, a carbon product is used which is formed by extrusion of powdered carbon

added with a binding agent into a honeycomb shape or by paper making of powdered carbon added with a binding agent into a corrugated fiberboard or a cardboard shape.

5 7. The method for manufacturing a silicon carbide-based heat-resistance porous structural material, according to Claim 4 or 5, wherein, as the resin applied by impregnation to the bone structure of the carbon powder-made porous structural body, at least one selected from the group consisting of a phenol resin, a furan resin, a
10 polycarboxysilane, an organic metal polymer, and pitch is used.

8. The method for manufacturing a silicon carbide-based heat-resistance porous structural material, according to Claim 4 or 5, wherein, as an additive added to the slurry
15 with which the bone structure of the carbon powder-made porous structural body is impregnated, at least one selected from the group consisting of powdered carbon, powdered graphite, and carbon black is used.

9. The method for manufacturing a silicon carbide-based
20 heat-resistance porous structural material, according to Claim 4 or 5, wherein, as an aggregate or an antioxidant added to the slurry with which the bone structure of the carbon powder-made porous structural body is impregnated, at least one selected from the group consisting of silicon
25 carbide, silicon nitride, titania, zirconia, zircon,

alumina, silica, mullite, molybdenum disilicide, boron carbide, boron, and powdered silicon is used.

10. The method for manufacturing a silicon carbide-based heat-resistance porous structural material,
5 according to Claim 4 or 5, wherein, as the powdered silicon contained in the slurry or the silicon used for melt impregnation, a silicon alloy containing at least one element selected from the group consisting of magnesium, aluminum, titanium, chromium, manganese, iron, cobalt,
10 nickel, copper, zinc, zirconium, niobium, molybdenum, and tungsten, or a mixture of the above element and powdered silicon is used.

11. The method for manufacturing a silicon carbide-based heat-resistance porous structural material,
15 according to Claim 4 or 5, wherein, as the resin of the slurry applied by impregnation to the bone structure of the carbon powder-made porous structural body, at least one selected from the group consisting of a phenol resin, a furan resin, a polycarboxysilane, an organic metal
20 polymer, and pitch is used, and as an additive added to the slurry, at least one selected from the group consisting of powdered carbon, powdered graphite, and carbon black is used.

12. The method for manufacturing a silicon carbide-based heat-resistance porous structural material,
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according to Claim 4 or 5, wherein, as an aggregate or an antioxidant added to the slurry applied by impregnation to the bone structure of the carbon powder-made porous structural body, at least one selected from the group consisting of silicon carbide, silicon nitride, titania, zirconia, zircon, alumina, silica, mullite, molybdenum disilicide, boron carbide, boron, and powdered silicon is used, and as the powdered silicon contained in the slurry or the silicon used for melt impregnation, a silicon alloy containing at least one element selected from the group consisting of magnesium, aluminum, titanium, chromium, manganese, iron, cobalt, nickel, copper, zinc, zirconium, niobium, molybdenum, and tungsten, or a mixture of the above element and powdered silicon is used.